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THE LAND
TODAY AND TOMORROW

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OFFICIAL BULLETIN

SOIL EROSION SERVICE
U. S. DEPARTMENT OF AGRICULTURE

THE LAND

TODAY AND TOMORROW

Issued Monthly by the
U. S. Soil Erosion Service
DEPARTMENT OF AGRICULTURE

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The Contents

Dust Storms Through the Years - - *Ewing Jones* - - - - - 1
Wind Erosion in the Great Plains - - *F. L. Duley* - - - 5
Conditions in Western Kansas - - *L. E. Call* - - - - - - 8
Utilization of Crop Residues - - *B. W. McGinnis* - - - - 12
Vegetative Restoration on the Gila - - *Fleming,Whitfield* 15
Woodland Conservation and Wild-Life - - *E. G. Holt* - - 18
Asphalt Terrace Outlets - - *J. M. Downing* - - - - - - - 22
Game Sanctuaries in South Carolina - - *J.S.Barnes* - - - 24
A First Course in Soil Erosion - - *W.L.Powers* - - - - - 25
One Lesson out of Thousands - - *Harold G. Anthony* - - - 28
Farmers of 40 Centuries - - *Mrs. Inez M. Lowdermilk* - - 30
Mapping the Cohocton Valley Soils - - *H.R.Adams* - - - - 35
Terracing Alone Insufficient - - *Ernest Carnes* - - - - 37

PRAYER FOR WEST TEXAS

BY MARTHA NELL LANG

Father--
We wake again this morning
With sounds of the wind's fury
In our ears, the stinging dust
Drawing tears unbidden from
Burning eyes.

Adults
Though we are, we see ourselves as
Frightened children, wondering with a
Gasp of despair, how long --
How long!

Earthquake,
Flood, or fire might leave behind the spark
For re-creation, but how combat this endless
Grinding out of spirit--grim yet almost
Imperceptible?

Build up
Around our hearts, dear Lord, strong
Walls of courage to withstand the rolling
Sand clouds -- sand that threatens to fog in --
To smother stubborn flames of hope still
Flick'ring there.

Blessings
On wives and mothers who let not the fruitfulness
Of homely tasks -- the knowledge that night
Will see the work undone -- destroy
Their purpose!

Renew,
We pray, our heritage of pioneers, indomitable faith,
Rare optimism, that we may face more blinding,
Choking storms with visions of a brighter,
Clearer day!

-- The Dalhart Texan.

Dust Storms Through the Years

By Ewing Jones

SPECIAL ASSISTANT

Homer refers to them in his Iliad, Virgil, in his Æneid — but these dust falls of yesteryear bear scant comparison to the modern scourge of the Great Plains.

"A drop of water hit a man, and they had to throw two buckets of sand in his face to bring him to.

"The dust was so thick I saw a gopher burrowing fifty feet in the air."

Humorous, these quips relayed by the Associated Press from the wind-swept, parched plains of the Middle West, in its reports of the recent dust storms, but behind them lies a tragic story whose grimness cannot be hidden behind jests or indifference.

Cities along the Atlantic seaboard were puzzled, but not startled, a year ago, when a yellow haze filled the sky for an afternoon, bringing a premature dusk. It was not until newspapers explained the phenomenon that thousands of urbanites realized that they had experienced their first dust storm, and the majority was still a bit dubious about the Weather Bureau's declaration that this dust traveled all the way from Nebraska and the Dakotas.

It took 1935's repetition of the menace of shifting farm lands to bring wind erosion to prominence in the public mind. When headlines everywhere repeatedly flashed the news that the worst dust storm in history was being experienced; when six deaths in a week were attributed to a strange malady dubbed "dust pneumonia"; when a disheartening evacuation of some 2,000,000 acres threatened to begin overnight; then the nation knew that these billowy clouds of yellow dust in the east, echoing the howling, blustering winds of the middle west, were an omen which could not be ignored.

A new era in land use for the High Plains had been ordered. The handwriting upon the wall was unmistakable.

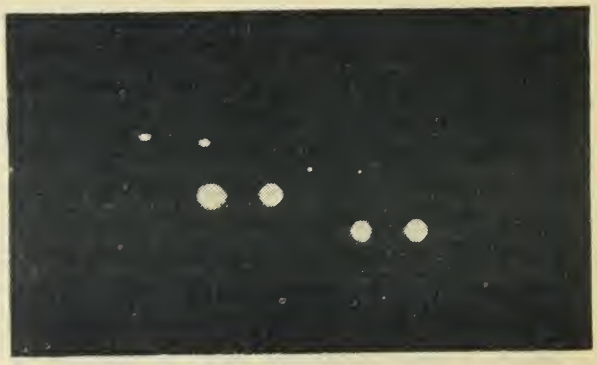
Dust storms are not new. The falls of reddish dust common to Southern Europe have been known since earliest times. Homer refers to them in his Iliad, Virgin in his Æneid. Investigations in 1847 cited a number of authenticated cases in the first three or four centuries before Christ.

Pioneers trudging across the great plains of the then unexplored American southwest during the latter part of the 19th century frequently ran into brief local disturbances, and occasionally encountered a strenuous dust storm that came from somewhere "beyond the rim of the earth."

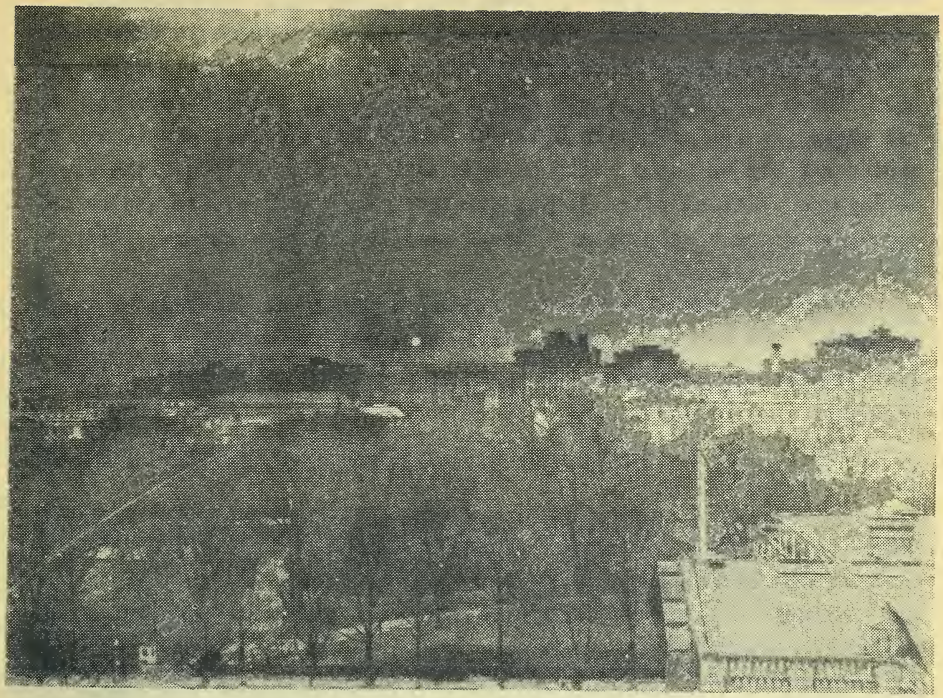
Dust showers succeeding the eruptions of Krakatoa in 1882 were collected as far as 1,100 miles from their origin in the East Indies. In 1902, a dust storm swept over the coast of Northern Africa into Italy, as far as the British Isles, Russia, and Denmark. It had started in the desert of El Erg, in the southern part of Algeria. Scientists noted then that the quantity of earth deposited on the earth gradually became less as it traveled, while the fineness increased as quantity diminished.

Improvident exploitations has been a frequent cause of sand drifts and wind erosion. The drifting sands of Cape Hatteras were started, authorities declare, by timber cutting following the close of the Civil War. The cutting of forests on the north German coast -- because Frederick I needed money -- has since cost the German government in reclamation work many times the amount obtained for the timber.

Sand shifting and swirling dust have had varied effects besides the destruction of valuable farm lands and the covering of cities. After 11 years service, telegraph wires along the Trans-Caspian Railway were removed because their diameter had been diminished one-half by sand blast corrosion. Destruction of the wooden telegraph poles through the San Bernardino Pass in Southern California is so rapid that the Southern Pacific Railway has been forced to protect them with piles of rock or with short supplementary poles on the windward side. And according to Dr. W. J. McGee, the Casa Grande ruins of Arizona were reduced to their present delapidated state largely by the sapping of their walls by sand drifts.



This photograph of two automobiles was taken at 4 P.M., with the camera held ten feet from the headlights.



When dust clouds from the West
hovered over Washington. Photo
courtesy The Washington Post.

The first known scientific description of dust storms was in 1646. However, it was not until 1911, when the Bureau of Soils of the U. S. Department of Agriculture published E. E. Free's monograph on the movement of soil material by the wind, that official cognizance was given the modern Aeolian problem. This monograph was thorough. It was a masterpiece. According to Free, the soil of any particular field is continually changing under the action of the wind. This action, when moderate, is beneficial to fertility; when excessive, it is one of the most serious obstacles to successful agriculture, and must be controlled by various expedients, such as windbreaks, cover crops and rotation schemes. Free's work was a digest of existing information upon the subject — this, mind you, a quarter of a century ago.

The cause of the present series of destructive storms in the Great Plains has been told and retold in recent weeks. The war period brought high prices, and farm land was at a premium. Frantically men plowed up the sod in the high semi-arid country. The soil which had been bound by sagebrush and buffalo grass and *agropyron smithii* was freed. Bare, it became an easy prey for the hot, parched winds which came with the inevitable cycle of dry years. Those dust storms of yesteryear bear scant comparison to these of 1935, as far as devastation is concerned.

And midwestern children last month scurried to school with moistened cloths clutched to their noses; a Kansas oil driller reported that "in digging a cellar for an oil well we dug down 18 feet and it was dry powder all the way down, with no semblance of moisture"; and the sage of Emporia, William Allen White, related: "In a real estate office this sign greets the townspeople: 'Great bargains in real estate. Bring your own container!'"

Bronze sunsets in the east, mid-day darkness in the West -- they are here. Man was incautious when he provided the cause; his prudence must provide the cure.

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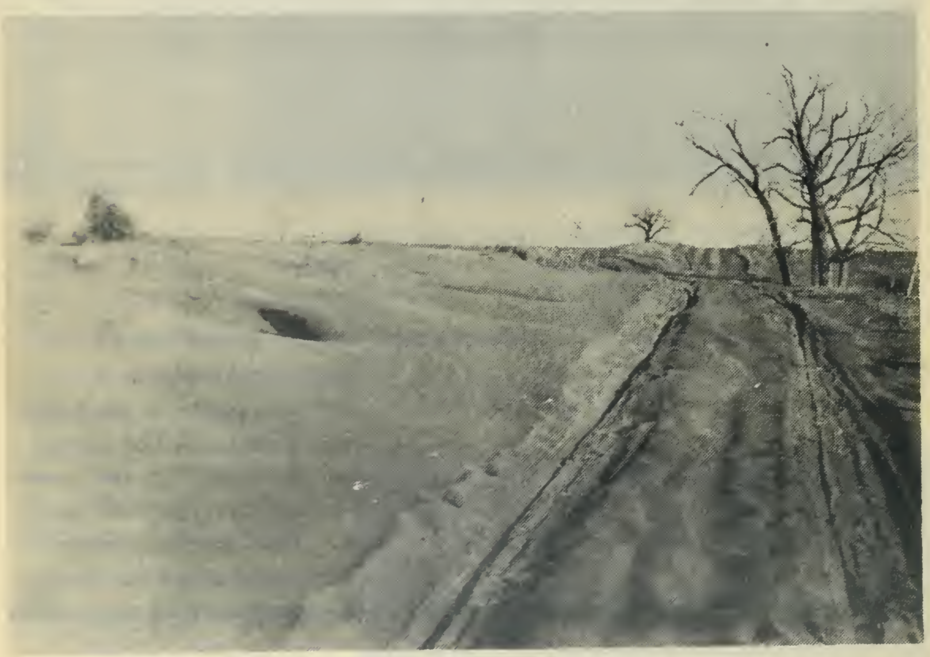


Soil collected in highway, due to drifting from an adjacent wheat field. Soil loss per acre: 80 tons.

Wind Erosion in the Great Plains

By F. L. Duley

REGIONAL DIRECTOR KANSAS AREA

Where there is any crop residue, little soil blowing has taken place — wind erosion, Duley says can be controlled only by radical changes in cropping methods

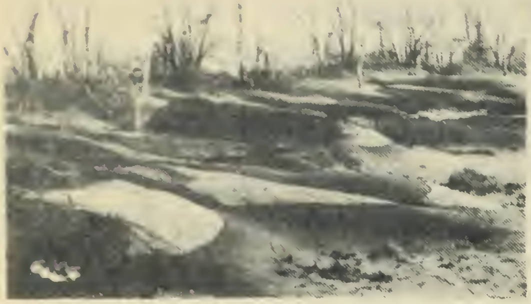
The dust storm which struck central Kansas on March 15 was unusual only because of its severity. In parts of this region, it was probably the most severe storm in years, although there is always a tendency for people to remark that, "This is the worst I have ever seen". There are some very fundamental reasons, however, why dust storms are more severe this spring than usual.

During the storm of March 15, I placed a flat bread pan filled with water in my back yard. When the storm had passed, I permitted the water to evaporate and weighed the soil remaining in the pan. The deposit was sufficient to indicate a general deposit of 3.25 tons per acre in the area over which the dust had blown. In this calculation, however, no consideration was given to the fact that all dust falling in the water was halted, while that falling on the ground may have been blown along the surface or lifted again into the air.

Measurements were also made of soil drifts which had accumulated along a snow fence and in a road ditch at the edge of a badly blown wheat field during two dust storms. These drifts, it was shown, contained soil equivalent to approximately 40 tons per acre. Another field lost some 80 tons an acre, according to similar calculations. Neither of these measurements took into account the fact that only the heavier soil particles were deposited in drifts and that tons of lighter particles were carried on to greater distances.

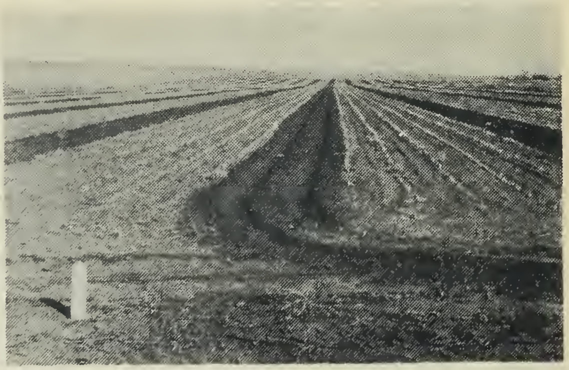
During these same storms, the dust accumulating along a snow fence in a good pasture amounted to only 860 pounds per acre, showing the importance of protecting the land with grass or other close-growing vegetation.

Last year was the dryest growing season on record and widespread crop failures left the soil with little or no protective cover. This lack of protection on very dry soil is generally agreed to be one of the principal causes of soil blowing. Another reason seems to be that many soils in this region become floury and fluffy after winter freezing and are very vulnerable to dry spring winds.

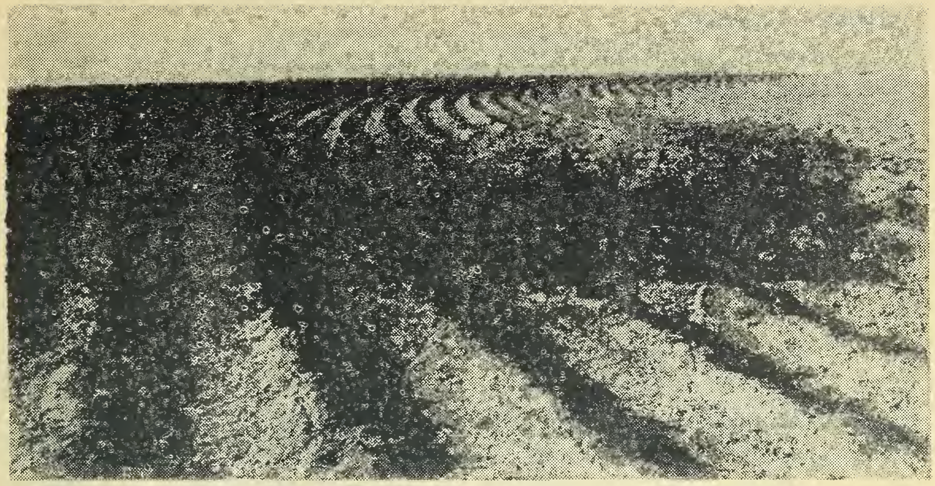

"Black snow" drifts.

Where there is any crop residue or plenty of Russian thistles on the ground, little blowing has taken place. Cornstalks may protect land to some extent, but in many cases the stalks are thin or have been pastured too extensively to afford much of a cover. This year there is practically no corn crop residue on the land and many cornfields are losing large amounts of soil.

Sod, under ordinary conditions, is the best protection against wind erosion. At the present time, however, nearly all sod land has been severely overgrazed due to the drought of last summer. This overgrazed pasture land is now blowing badly and will continue to do so until rain falls.


Lister furrowing at intervals of one or two rods will do much to reduce wind erosion.

A luxuriant fall growth of winter wheat is one of the best protections against wind erosion. This year however, winter wheat made very little fall growth due to drouth, and some of the most severe blowing is taking place on these poorly covered wheat fields; in many cases, wheat in the ground has been destroyed. Even fields which had turned green with spring growth have turned a distinct brown since the last two storms. In some fields, blowing has progressed to such an extent that much of the wheat has been blown out or covered. The extent of this damage is difficult to estimate with any degree of accuracy at this time.



One measure of wind erosion control. Fields in the Mankato area listed on the contour have suffered relatively little from blowing.

The effects of our work in this area are evident in many places. Fields listed on the contour have suffered relatively little from blowing. Some of the furrows are drifted nearly full, but practically no soil has left the ground. Terraces have caused the deposition of soil on the lee side in some cases but there is considerable blowing between terraces where the wind has a clear sweep, particularly where it blows horizontally with the terrace.

Any cultivation which roughens the surface tends to reduce blowing. A shovel cultivator which turns up pieces of moist soil to form a cloddy surface, will do much to check movement by the wind. The lister is also effective when used for this purpose. Lister furrows, run through at intervals of about one rod and at right angles to the prevailing wind direction, will lessen blowing appreciably. These are only temporary measures, however, and should be employed only in emergency. More complete control will come with the establishment of proper cropping systems.

Planting a field to several different crops offers one of the most practical methods for reducing the amount of blowing, although it is more permanent in nature and requires time to become established. During the past year, our plans for covering the land with vegetation in belts across the slopes have been retarded because there has been insufficient rain to get grass, alfalfa or small grain crops started.

Rain in the near future would reduce blowing this year and might give an opportunity for farmers to get some spring crops started on the land. At the present time there is hardly enough moisture in the soil to bring up oats or sweet clover. Some of these are being planted more in the hopes of rain than anything else. We hope to delay our grass seeding until the soil has obtained sufficient moisture to bring the plants up quickly.

We have every reason to believe that wind erosion can be controlled effectively in Western Kansas and much of the Great Plains territory. However, we know it can be done only by instituting radical changes in cropping methods and in the handling of fallow land. This should form a very important part of any Soil Erosion Control program in the Great Plains country.

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Conditions in Western Kansas

by L.E.Call, Director

KANSAS AGRICULTURAL
EXPERIMENT STATION

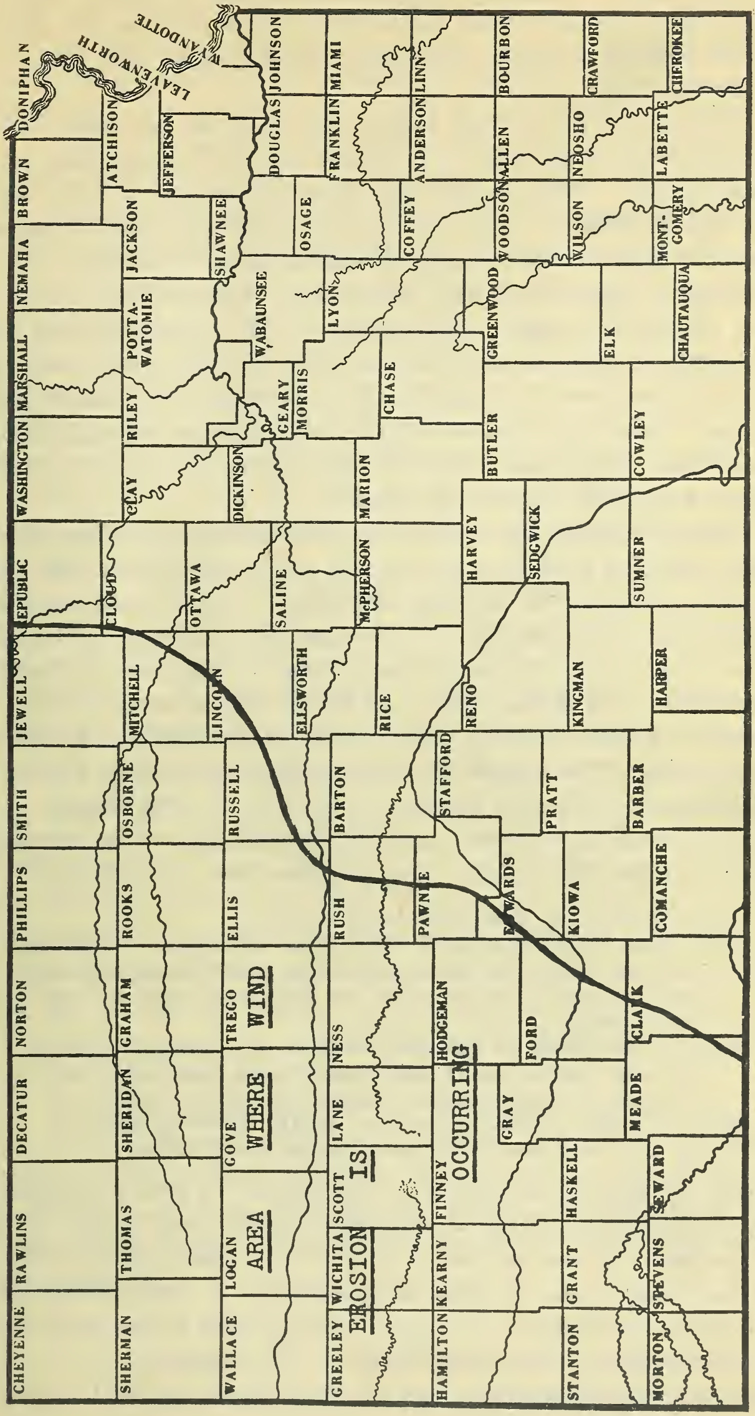
Last month I traveled through much of the territory in Western Kansas where trouble is being experienced with blowing, conferring with farmers, business men, county commissioners and county agents from 19 southwestern Kansas counties.

The accompanying map gives the area in the state where destructive soil blowing is occurring. There are a few areas east of the line indicated on the map, especially in the north central part of the state, where some blowing is occurring, and there is much territory west of the line where there is sufficient wheat and other soil cover to prevent destructive blowing.

It is estimated that there are approximately ten million acres of cultivated land in the territory lying west of the line indicated on the map. It is further estimated that it will be necessary to list between two and three million acres of this land to control soil blowing. The cultivated land remaining in this area should be listed either solidly or strip listed as a protective measure against blowing and as a preparation for the planting of spring crops and for fallow.

The conditions in the area where blowing is occurring may be classified under three types:

1. *Areas in which there is a soil cover of growing wheat.* These areas represent sections where showers last fall made it possible to start wheat and maintain the crop through the winter. Very little


AREA WHERE WIND
EROSION IS OCCURRING
CHEYENNE
RAWLINS
DECATUR
NORTON
PHILLIPS
SMITH
JEWELL
REPUBLIC
WASHINGTON
MARSHALL
NEMAHA
BROWN
DONIPHAN
SHERMAN
THOMAS
SHERIDAN
GRAHAM
ROOKS
OSBORNE
MITCHELL
CLOUD
CLAY
RILEY
POTTA-
WATOMIE
JACKSON
ATCHISON
JEFFERSON
LEAVENWORTH
WYANDOTTE
WALLACE
LOGAN
GOVE
TREGO
ELLIS
RUSSELL
LINCOLN
OTTAWA
DICKINSON
GEARY
WABAUNSEE
SHAWNEE
DOUGLAS
JOHNSON
GREELEY
WICHITA
SCOTT
LANE
NESS
RUSH
BARTON
ELLSWORTH
SALINE
McPHERSON
MARION
MORRIS
LYON
OSAGE
FRANKLIN
MIAMI
HAMILTON
KEARNY
FINNEY
HODGEMAN
PAWNEE
STAFFORD
RICE
RENO
HARVEY
CHASE
COFFEY
ANDERSON
LINN
GRAY
FORD
EDWARDS
PRATT
KINGMAN
SEDGWICK
BUTLER
GREENWOOD
WOODSON
ALLEN
BOURBON
STANTON
GRANT
HASKELL
KIOWA
BARBER
HARPER
SUMNER
COWLEY
ELK
WILSON
NEOSHO
CRAWFORD
MORTON
STEVENS
SEWARD
MEADE
CLARK
COMANCHE
CHAUTAUQUA
MONT-
GOMERY
LABETTE
CHEROKEE

blowing has occurred in these areas. The fields, however, are covered with a thin layer of dust and should be strip listed wherever the wheat is thin, with one lister furrow about every rod east and west across the field as a protection against blowing until good rains settle the dust.

2. *Areas in which extreme blowing has occurred and where the surface condition of the soil is such that the soil blows whenever heavy winds occur.* These areas vary in size from two to three sections to 100 sections or more. It is futile for individual farmers to attempt to control soil blowing in such an area. The soil will drift in over a listed field from surrounding territory as fast as it can be worked by a single listing unit. Soil blowing on such areas can be controlled only through cooperation of a sufficient number of listing units to cover the entire area in a comparatively short period of time. This will require careful, well-planned organization and good execution. Every foot of cultivated land in a territory of this kind should be listed solidly and deeply.

3. *Areas intermediate between the two extremes described above.* This class embraces from 50 to 75 percent of the cultivated land shown on the map as being in the blowing territory. In this area there are many individual fields ranging in size from small patches to a single section or more. These fields are surrounded by sod land, by cultivated land with a sufficient cover, or by cultivated land that has been worked to prevent blowing. Such areas can be controlled by individual farmers if the fields that are blowing are solidly listed and if the surrounding territory subject to blowing is strip listed.

There are several factors that make it difficult to perfect an organization to control blowing, some of which are the following:

Land operated by non-resident owners.
Land owned by non-resident owners and operated by resident tenants who do not have sufficient interest or who are not financially able to do the work necessary to control blowing.
Land in the hands of resident owners and operators who do not have sufficient funds to purchase feed, oil, gas and repairs for equipment needed to do the work.
Lack of funds available for the county commissioners to pay for work that they have authority to order.

It was the general concensus of opinion of the county commissioners from the 19 counties that if sufficient funds could be made available to purchase oil and gas and to keep lister shears sharp while the work was being done, it would be possible to do the work necessary to control the blowing. It is my opinion that $1 for each acre to be listed would be a sufficient fund for this purpose.

There are limited areas in the territory where the soil is too dry and sandy to hold following listing. There are other areas that have been poorly tilled in the past where the soil is so hard and dry at this time that it cannot be worked satisfactorily by ordinary farm implements until soaking rains fall. County road machinery may be available in limited amounts for work on this type of land.

While a general soaking rain is urgently needed to settle the dust on all fields and to put the soil in better condition for working, it should be recognized that rains of this character will not solve the problem completely where extreme blowing has occurred. The soil will blow again within a comparatively short time after a heavy rain in such areas as described under Type 2 above. The soil must be listed before blowing will be completely checked. There are many fields near heavily blown areas where cover such as heavy stubble or a heavy growth of Russian thistles has caught and held the loosely blown soil to such an extent that these fields are covered with a layer of dry dust of sufficient depth to be almost impervious to water. These fields must be listed before they will absorb moisture readily. Many of these fields are not a menace to surrounding land in their present condition. However, on fields only partially covered with thistles the soil has blown into large mounds several feet high, around which the soil continues to blow with every heavy wind. It will be necessary to work areas of this kind with a lister before the blowing can be checked, although this work probably should be delayed until surrounding land in better condition for working has been listed.

Seriousness of conditions in the areas where extreme blowing has occurred cannot be overemphasized. Houses in such regions will not exclude the fine dust. Living conditions become impossible and farmers are compelled to move their familes out of such areas. The dust is a menace to livestock and some stock is dying. The dust has also severely injured the stacked and shocked feed in the territory where extreme blowing has occurred. Buffalo grass pastures have been blown to such an extent that the exposed crowns of the plants are destroyed by livestock grazing such pastures.

It should be recognized that these conditions are not confined to the state of Kansas. They are conditions prevailing throughout the Central Plains States embracing, in addition to western Kansas, parts of Nebraska, Wyoming, Colorado, New Mexico, and the Panhandles of Texas and Oklahoma. These conditions should be attacked as an interstate problem.

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Utilization of Crop Residues to Reduce Wind Erosion

By B. W. McGinnis

AGRONOMIST DALHART PROJECT

Farmers of the high plains are confronted with the problem of producing crops under conditions of a minimum of moisture and a maximum of wind. Continuence of agriculture under plains conditions requires intensive moisture conservation to produce adequate vegetative cover and thus protect the soil from blowing.

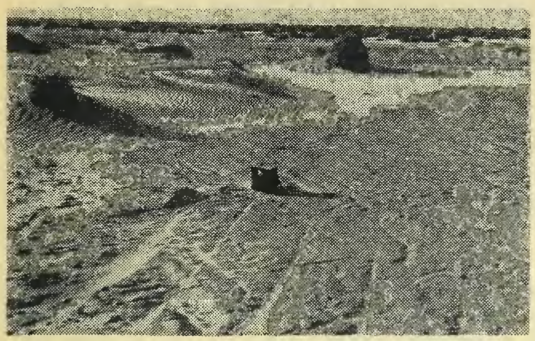
Much of the land in the wind-swept areas has been farmed by ranchers and livestock farmers who generally used crop residues for feed. While this method has been of temporary financial benefit to the stockman, its abuse has resulted in an enormous loss of soil resources. On many farms, no sooner had the crop of grain sorghums been harvested or a cover of green growing wheat established, than the farm stock, or worse still, large herds from nearby ranches were turned into the field to consume the crop residues and trample the ground into an ideal condition for blowing.

Several abandoned farms that have been ruined by wind erosion, due to the absence of vegetative protection, are on the soil erosion control project at Dalhart. The owners of these farms testify that after good crops of grain sorghums were harvested in 1931 and 1932, the crop residues were entirely removed, either by overgrazing or harvesting for fodder. In the case of several wheat farms, either the growing wheat was destroyed by overgrazing or allowed to mature, and the straw burned from the field to facilitate subsequent tillage operations. The farms themselves bear mute witness to this wasteful system of soil robbing which has turned once productive land into desolation and ruin.

These fields, from which the rich topsoil has been stripped by wind and piled up in roadsides and adjacent fields, give unmistakable warning of what will follow if measures are not taken to establish and preserve a vegetative cover, continuously, on all land in the wind-swept area. The only hope for survival of plains agriculture is to establish a program of intensive moisture conservation to insure a continuous crop cover.

In bright contrast to the abandoned farms are those on which the crop residues, in the form of stalks and stubble, have been left to protect the land from blowing. These farms have not suffered from wind erosion. The depth of soil in this region is sufficient to make possible the reclamation of many abandoned farms and to justify every effort being made to save the topsoil on all farms from further wind damage.

During 1933 and 1934 the rainfall was not sufficient to produce adequate vegetation on most fields under common tillage practices. Eight years' experiments show that on terraced and contour tilled land, the supply of soil moisture made available to plant roots was increased twenty-five percent, compared with land farmed in the ordinary way. As a result, the average crop yield increased thirty-three percent. During the 1934 season, one of the driest years on record, the increased yield of forage crops on terraced land was thirty-seven percent greater than on unterraced fields.



Wind-swept field near Dalhart. Marks of the plowshare may be seen plainly.

In view of these conditions and in the light of experiment, the job of the Soil Erosion Service in the high plains region is to bring about terracing and contour farming of all land subject to water run-off and to insist on the maintenance of sufficient vegetation on the land to protect it from the ravages of wind.

To be effective, any wind erosion control program must provide a continuous crop cover on the land through long periods of excessive drouth. There is considerable variation in the adaptability of crops for protection from wind erosion. They naturally fall into two classes, resistant and non-resistant. All stooling varieties of grain sorghums have proven most effective in anchoring the soil. The tough, fibrous stalks and abundant root systems of milo maize, kaffir corn, hegaria, sudan grass and cane are sufficiently durable to anchor the ground from season to season. On one 500 acre field in the worst wind-damaged section, milo maize stubble has been holding the soil since the fall of 1933.

Corn and cotton fall in the non-resisting class. Under semi-arid conditions they do not develop an adequate root system and the stalks are not sufficiently tough to survive long periods of punishment by wind and weather. When corn or other non-resisting crops are grown, strip-cropping with grain sorghums should be employed. Land that is being summer-tilled in preparation for wheat can be very well protected by wide-space rows of grain sorghums without detriment to the wheat crop. The width of the strips and intervals between strips should be governed by the type of soil, the topography of the field, and any other factors that might contribute to the danger of wind erosion.

If, for any reason, regular crops fail on land subject to wind erosion, off-season plantings of emergency cover crops must be made without regard to immediate commercial returns. The residues from regular crops, as well as all emergency crops, should be left on the land until conditions are favorable for the resumption of the regular crop program.

Although the farming hazards may be great in this land of minimum rain and maximum wind, it should be borne in mind that by the application of a sane system of conserving rainfall, and by exercising constant diligence in the utilization of the resultant vegetation for soil protection, those hazards will be materially reduced.

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AND IN A LIGHTER VEIN...

(We can't vouch for the veracity of these.
-- The Editor).

Many farmers in the Dalhart section have devised a novel means of determining the exact condition of the weather. A long heavy log chain is tied on a post about four feet above the ground. When the wind blows hard enough to straighten the chain, then the farmer decides possibly it might be too windy to work so gathers up his family and goes visiting.

A farmer going along the highway out north of town was caught in a sandstorm which was so bad that he had to stop his car because he found himself climbing up on the sand in the air. He decided to wait until the worst was over. When the worst had passed and the visibility was such as he could see what had happened, he observed a Stetson hat over in the field on top of a sand dune that was not there before the storm hit. Thru curiosity, he investigated. He discovered it on a man's head.

After scratching away a little of the dirt, he asked, "Could I help you out?"

"I don't think that's necessary", the man replied. "I am on my tractor and by tomorrow the wind will come from the other direction and blow the sand away and I can drive out".

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Possibilities of Vegetative Restoration on the Gila

By B. P. Fleming and C. J. Whitfield

GILA PROJECT

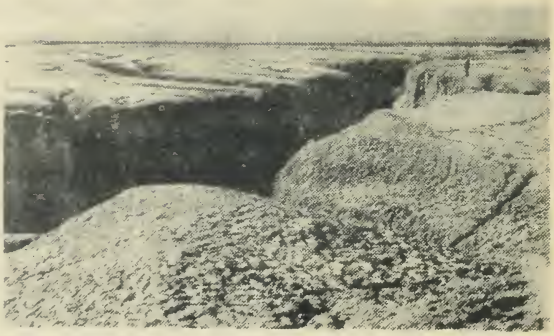
The eight and one-half million acres of mountainous, mesa and valley country comprising the upper Gila watershed extend from Coolidge Dam on the Gila River through southeastern Arizona, and southwestern New Mexico into the high country of the Mogollen range. In this area are a diversity of elevations, soils, climates, and vegetation, the latter ranging from some of the heaviest timber remaining in the United States to scant desert vegetation at the lower elevations. Elevations range from 2600 to 10,000 feet above sea-level, while the annual mean precipitation varies between 7.48 and 19.92 inches.

The Gila River is a torrential stream. Flood flows occur mainly in the summer months, following heavy rains on the watershed, but the river also may have spring rises due to melting of snow in the higher elevations. The valleys through which the Gila and its tributaries flow are for the most part filled with alluvial debris. Under primitive conditions these tributary valleys are known to have been covered with comparatively dense growths of perennial native grasses valuable for forage. The streams in the valleys generally occupied shallow meandering beds, and though in flood time they overflowed, the adjacent meadows were so thoroughly covered with grass that cutting or erosion did not occur. In contrast to these docile primitive conditions, the entire watersheds of the Gila and its tributaries now present one of the most savage and melancholy spectacles of man-induced accelerated erosion in the United States.

Extensive agricultural interests in the alluvial valleys along the Gila and some of its branch streams are now threatened with submergence by annual floods. It is estimated that in the past twenty years approximately 20,000 acres of rich irrigable lands has been lost as a result of side-cutting and bank erosion on the main Gila. No less serious is the rapid diminution of the storage capacity of the great Coolidge Reservoir which was created under the auspices of

A fine expanse of tobosa grass, prevalent throughout the Gila when the white man reached the region.

the Indian Service to supply irrigation water to the 100,000 acre San Carlos irrigation project. Recent surveys indicate an alarming rate of sedimentation in the reservoir, due to erosion in the contributing drainage area.
The conditions undoubtedly have their origins in the improvident and harmful grazing practices of the past seventy years.
The climate and pastoral resources of the pristine country led to the introduction of vast herds of cattle, sheep, and goats, and the public lands policy of the United States permitted ruthless exploitation of the grass lands by the grazing interests. As a consequence the grasses have almost disappeared and the soil is either wholly exposed or is covered with a sparse vegetation consisting principally of what is known as burro weed *(Haplopappus heterophyllus)*, creosote bush, *(Covillea tridentata)* and varying amounts of annual and weed vegetation. The only exceptions are found in the extensive areas of the natural forest and certain fenced areas. The alluvial valleys once covered by dense growths of tobosa, sacaton and other native grasses, are now intersected by deeply intrenched arroyos which drain the adjoining lands so that this former growth of grass has entirely disappeared over considerable areas.



Franklin flats, an area that was once similar to that shown in the photograph left above.

The meandering stream has left this bridge utterly useless.

One of the most important objectives of investigative studies on the Gila Project is the determination of the possibility of restoring vegetation on these depleted range lands. Reestablishment of proper vegetative cover will not only aid in preventing erosion but will provide valuable forage for grazing purposes on areas that are now practically denuded. The decrease in carrying capacity of these range lands, due to overgrazing and accelerated erosion, is perhaps the most serious loss that has been suffered in the southwest cattle country.

During the winter of 1933-34 fenced plots were established to study the response of natural vegetation to protection from grazing. Results obtained thus far are especially enlightening as to the possibilities of restoring vegetation by natural means over large parts of the watersheds. In a plot near Duncan, Arizona, for instance, there was a marked recovery in the volume of native perennial vegetation, indicating that with a little protection from grazing a very much more favorable cover could be secured. As this plot has been established for only a year it would indicate that this particular type of country would recover very rapidly. In other plots annual grasses and weeds have grown abundantly, thus adding desirable humus to the soil, and helping in the reestablishment of the longer lived plants. Another interesting observation in some protected areas is the fact that shrubs are crowded out and killed by grasses. This is highly important on the Gila watershed as shrubs generally invade heavily grazed areas and kill out the more palatable grasses.

In addition to the natural recovery, enough artificial reseeding work has been done to indicate the trends that this work should take and to illustrate that the possibilities of success are fairly good. Also, over 20,000 plants from the U. S. Forest Service Nursery at Superior, Arizona, have been planted in different soil types at various altitudes. Fully 95% of these plants have survived.

In all of this work further study will be necessary, but enough has been done on the Gila project and in the Southwest to indicate that the possibilities of restoring the native vegetative cover are good. Grazing must be regulated, however, and enough check dams and other engineering works established to effect some measure of stabilization of soil conditions and to retain in the denuded areas a greater percentage of the rainfall.

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Woodland Conservation and Wild Life Preservation

By Ernest G. Holt

CHIEF FORESTER LA CROSSE PROJECT

The work program of the Soil Erosion Service is unique in that it unites all erosion control methods of proven value in a single, closely coordinated plan.

Forestry and wild-life conservation are but parts, integral and important, to be sure, yet parts only of this comprehensive program, and neither would retain its full effectiveness if sepasated from the whole.

After all, why should we conserve our woodland and preserve our wild-life? Like Will Rogers, I can do no better than turn to the newspapers for my texts.

The first headline of a current paper to catch my eye was this: "8,000 Persons Now Homeless in Flood Areas." A grim tragedy. A local journal recently devoted three columns to discussion of conservation matters, winding up with an argument for a crow hunt. In order to obtain proper perspective for consideration of these questions, let us lift our eyes a moment beyond the bluffs that fill our immediate foreground, and survey the national scene.

What do we see? Thousands driven from their homes in the lower Mississippi Valley; other thousands choking in dust storms in Kansas and Texas; still more thousands, beaten and hopeless, doggedly trying to eke out a living on eroded farm lands from which every vestige of topsoil has been washed. Dissimilar though the cases may seem, the underlying cause is the same. Man's careless misuse and abuse of the land resulting in soil depletion and denudation is that cause.

When Joliet and Marquette reached the Mississippi, practically unbroken forests undulated over the hills as far as the eye could reach. This condition continued for many years thereafter, but in the '40's came the axe and the plow, and the face of nature was lifted in more than a metaphorical sense. Styles for hills as well as for men have changed, and the hills, like the descendants of the bearded pioneers, now go clean shaven. Today no less than four hundred million tons of soil washed from unprotected fields are carried out to sea by the Mississippi River each year.

Mature, unburned, ungrazed forest is the best protective covering that Nature has yet devised for the soil. By the same token, it is her best agent for the prevention of runoff, and her most effective insurance for the stabilization of stream flow and for the life of those sparkling springs that mean so much to everyone.

By actual measurement, a forest experiment station has demonstrated that the amount of rain running from fields, even when cultivated on the contour, during a 2-year period was more than 64 times as great as the runoff from mature oak forests. Moreover, this same runoff swept 1750 times as much soil from the fields as the woods. From fields with rows running up and down hill, the soil loss was nearly 5,000 times greater than that from the woods. Could there be more convincing proof of the protective value of woodland?

It must be remembered, however, that the woods in which these measurements were taken were unburned and ungrazed. The effectiveness of woodland in preventing runoff and erosion is a measure of the porosity of its soil, and this in turn is conditioned by the state of the ground cover. Forest from which the spongy floor-covering of leaf-mold and litter has been removed by fire is practically worthless from an erosion control standpoint. Overgrazing is scarcely less disastrous to the forest, and has but little more justification than burning. An investigator has truly said, "A woods pasture is a poor pasture and a poor woods."

Now, we are not Utopian enough to try to bring back pristine conditions. The frontier has passed, and this has become an agricultural country. Our farmers cannot grow corn or cotton or tobacco in the woods. Therefore, the program of the Soil Erosion Service is designed to meet conditions as they are, and we ask nothing that is not reasonable and practicable.

What we do expect of our cooperators is that they will cease to clean-cut the timber from steep slopes; that they will refrain from burning and pasturing their hillside woods; and that they will rededicate to forest, all land steeper than a certain critical gradient. So vital are these measures for the control of erosion and for the general welfare of the community that we gladly furnish the trees for reforesting such places, and set them out ourselves.

Thus woodland conservation occupies an important place indeed in our program. Conservation, however, does not mean bottling up in a museum; it means wise use, with adequate provision for perpetuation. Under our program therefore, a woodlot is not fenced off and forgotten; it is managed to obtain maximum rainfall absorption, maximum protection against erosion, maximum sustained yield of timber, and maximum sustained yield of wild-life.

As all of our activities are prededicated on conservation, with the first objective the conservation of our most basic natural resource -- the soil -- our program must be essentially one of correct land use. Such a program would certainly not be complete if it made no provision for wild-life.

Our bumper crop of restrictive laws regulating the taking of game got its start soon after the Mayflower landed, but the game crop has prospered in inverse ratio. When laws failed, we turned our attention to predators and proceeded to persecute every creature that so much as cast a hungry eye in the direction of anything we ourselves wanted to eat, or wanted to kill just for the fun of it. And still the game declines. Obviously something is wrong.

In our zeal to advance civilization we have unwittingly and otherwise destroyed habitats that are absolutely essential to the wild-life we would preserve. We would hardly expect ducks to raise their broods in a dry pasture or quail to thrive in a clean-tilled corn field, yet that is in effect what we are asking them to do.

It is the purpose of our program to correct this situation insofar as is compatible with the primary use of the land. We are asking our cooperators to let us help them restore the environmental conditions essential to the welfare of desirable wild-life. Generally this means the re-establishment of adequate food and cover, which in large part can be accomplished as an erosion control measure.

In a word, we are trying to restore wild-life by scientific management of environments. This does not mean predator control. This is about the last thing contemplated, though some degree of local control may sometimes be necessary. If man had not destroyed essential wild-life condition, predators would never need be considered at all.

Old-timers love to dwell on the great abundance of game that flourished in this country during pioneer days, yet there was no cry raised against predators then. Why should it be raised now? If the game on which the predators depend for food has declined, it is plain that the predators themselves must have declined proportionately. Yet some advocates of extermination contend that the predators have increased while their food supply has dwindled. Perhaps they have learned to live on the climate.

A writer in a recent paper urged hunters "to organize and do a little conservation missionary work" by exterminating crows, apparently on the grounds that they are responsible for the decrease in waterfowl. Such proposals are deplored, not because of any great harm that they may bring to crows as a species, but because of their advancement in the name of conservation.

The crow has been persecuted for generations. One state has even revived the barbarity of the World War to bomb the crow while he sleeps. But has any good been accomplished by this war to exterminate the crow? Precisely as much as by the "War to Make the World Safe for Democracy."

When the vegetative cover of the lake shores of the duck country has been destroyed by overgrazing, it should be perfectly obvious why crows find and destroy the duck eggs. The remedy should be equally obvious. Yet, instead of applying it, we go out and wage war -- an utterly futile war -- on the crows.

I was told recently by a scientist who investigated conditions on Canadian duck nesting grounds last year, that in not a single instance did he find anyone who had seen with his own eyes a crow breaking up a duck's nest. We know perfectly well that a crow would not refuse a meal of duck eggs spread in plain view before him. It is significant, however, that the great hue and cry that has been raised against the crow since the decline in ducks became so acute is, like so many charges against predators. In general it is based not upon scientific evidence, but upon the say-so of someone who has ammunition to sell, or somebody else who has some other axe to grind.

This is not a defense of the crow. He needs none. I merely use the crow to drive home the fact that we have fallen into the habit of taking our conservation, like our politics and religion, on hearsay, when we should be using our brains to get at the real causes of the decline of our natural resources, and find cures for them.

Instead of passing the buck to the crows and the hawks and the owls, we should get out and do something about restoring the conditions essential to the existence of desirable wild-life if we expect to check its disappearance. Likewise we should restore conditions essential to the existence of good forest cover if we would check the erosion from our steep hillsides. This is what the Soil Erosion Service is doing on the Coon Creek Watershed.

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SANDSTORMS AFFECTING PUBLIC HEALTH

Some conception of the tragic aspect of the duststorm cataclysm in the Great Plains may be gained by a study of the reports from the health officers in eighteen counties. With but one exception these officials report an unusual number of cases of pneumonia and throat trouble, either directly caused or aggravated by the inhalation of dust. Five of the officials report fatalities caused by complications attributable to dust.

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Asphalt Terrace Outlet

By J. M. Downing

AGRICULTURAL ENGINEER ROCK HILL PROJECT

Because of the small acreage drained by the average terrace, the cost per acre of constructing terrace outlets is often excessively high in proportion to other costs involved in the erosion-control program of the Soil Erosion Service. Although stone and other native materials ordinarily used in outlet construction are usually available at little or no expense, the assembling of materials at desired locations, together with expense of excavating for structures, brings about a high unit cost. In some localities, scarcity of native building materials has made the cost of permanent outlet construction prohibitive.

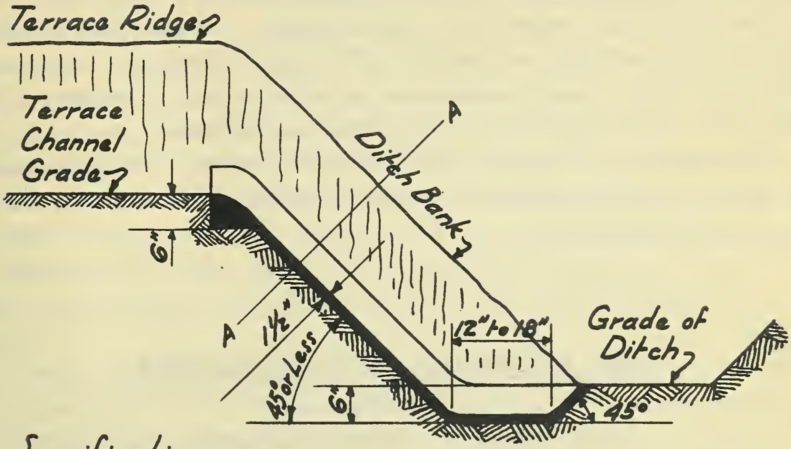
In meeting this problem of costs, we have experimented with excellent results in South Carolina by constructing asphalt outlets. The materials used are coarse sand and asphalt; the sand is always readily available and the asphalt costs 15¢ to 20¢ a gallon. Five gallons of asphalt will build the average terrace outlet.

Excavating costs are low since only shallow excavations are required. As the accompanying illustration and diagram show, an outlet excavation should be made with a broad, flat bottom and flared sides. This design not only makes it easy to lay the asphalt, but serves to spread out-flow water. One man can excavate and lay the asphalt for an average outlet in half a day.

After experimenting with different mixtures and combinations of materials, we found that best results are obtained by using 12 parts dry coarse sand and one part liquid asphalt, the asphalt containing 20 to 30 percent naptha, and of 40 to 60 percent penetration. The mixture is used by the South Carolina State Highway Department and supplies can be had at their warehouses. The sand must be dry and clean. It would be well to dry

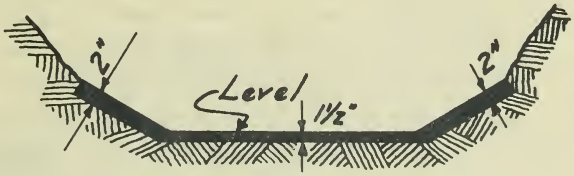
Asphalt terrace outlet

Asphalt Terrace Outlet



Specifications:

Cut back asphalt
30% Naptha
40-60% Penetration
1 part asphalt to
12 parts sand



Section AA

by artificial means, heating a small quantity at a time on a piece of sheet-iron over a fire.

The sand and asphalt should be thoroughly mixed with a hoe or shovel, piled up and allowed to take an initial "set" for a period of 24 to 36 hours. It is absolutely useless to put the mixture in place on an incline before this initial "set" is completed.

After the preliminary "set", the asphalt mixture is ready to be placed in the excavation. It should be spread in a layer about 1½ or 2 inches thick and tamped until it is compact. *Tamping is the most important part of the construction of an asphalt outlet.* It is our experience that a spade, because it is light enough to be used effectively on an inclined place, is the best tamping tool.

This work is of course experimental at present, and time alone must prove its effectiveness. However, results obtained thus far have been very encouraging.

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GAME SANCTUARIES IN SOUTH CAROLINA

By J. S. Barnes

CHIEF FORESTER SPARTANBURG PROJECT

As a start at restocking the 33,000-acre game preserve set up within the erosion control project at Spartanburg, S. C., 116 pairs of Bob-white quail were recently released on posted land. The quail were purchased by the State Game Department and released by A. A. Richardson, Chief Game Warden. The Game Department reserved the right to trap birds and release them in other sections of the county at any time, should it be found that the preserve is overstocked.

Sportsmen and game associations, quick to realize the possibilities of game preservation in the soil erosion control program, are exhibiting a great interest in the work in this section. Vegetation planted to check erosion will, also, furnish food and cover for quail and other birds and small animals.

The game sanctuary within the Tyger River project was launched last summer through the cooperation of sportsmen, state game officials and the landowners. Before the opening of the current hunting season owners of 33,000 of the 120,000 acres in the watersheds signed agreements prohibiting hunting on their lands for a period of five years.

These game sanctuaries are a good example of cooperative effort in game conservation and it is expected that the local quail coveys will soon be the envy of other sections of the state. Game conservation means care of the vegetation, food and cover for the birds, and a step in erosion control.

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A First Course in Soil Erosion

By W. L. Powers

SOIL SCIENTIST   OREGON AGRICULTURAL COLLEGE

In response to an increasing demand for instruction in soil erosion control, one of the first college courses treating the subject as an entity was offered at Oregon State College during the 1934-35 winter term. This course consisted of some 14 lectures, recitations, and a dozen laboratory periods of 3 or 4 hours' duration each. Over 200 recent references on erosion were supplied covering the various topics discussed. Several of the students reviewed as many as from two to three dozen references. In the absence of any text, a search for recent literature was necessary. The mimeographs supplied by the U. S. Bureau of Agricultural Engineering proved to be especially good text material.

Lecture subjects included extent and effect of erosion, (illustrated with nearly 100 views); geological aspects of erosion; measurement of rain, snow, runoff and washoff; methods of studying soil erosion; wind erosion and its control; farm windbreaks, shelter belts, and wood lots; soil characteristics related to erosion; soil organic matter, soil granulation and erosion; terracing; gully control; ter-

Erosion and runoff plats studied by the class.

racing machinery; vegetative cover; soil erosion and land use; and a summary of soil erosion control measures. Four staff members outside of the Soils Department, and a representative of the Soil Erosion Service, participated in this lecture series.

Building a simple wire and brush check dam for gully control.

The recitation periods included two illustrated lectures, two quizzes, and discussions and reports. One term paper was prepared in competition.

The laboratory work included surveying and mapping of a quarter section, determination of dispersion ratio, moisture equivalent, erosion ratio, maximum settling volume, natural state of aggregation, measurements of field runoff and washoff, determinations of solids; for graduate students, determination of total nitrogen lost, a gully survey, inspection of forestry erosion plats, terrace survey practice, production of gully stops, survey for a stream dike and mattress, measurements of runoff and washoff from erosion plats, measurement of the transporting power of wind through a wind tunnel, and a field trip to the northwest erosion demonstration area and experiment station.

New equipment secured especially for the course included a wind tunnel 2' x 2' in cross-sectional area, and 24' long, of veneer with triangular 2" strips in the corners, flared at the exist end to double the area, a screened frame with muslin being placed at that end to collect the lightest dust. A honeycomb made of heavy paper tubes 2" in diameter and 6" in length was included to eliminate eddies in the tunnel. An anemometer and a 16" electric fan were used. A strip of butcher paper placed in the bottom of the tunnel and ruled off in 2' intervals was used to collect the dust of different sized particles introduced in front of the honeycomb into the tunnel a little at a time. The tunnel is made in 8' sections and is portable. Cost of the tunnel material was $8.00.

The same check dam, completed, being given a severe test.

Eight erosion plats 3.3 feet by 13.2 feet were made by surrounding these areas with creosoted 1 x 6 lumber sunk 4 or 5 inches into the soil to form boundaries. A galvanized tin gutter was provided at the lower end of each plat to catch the runoff, which was collected in discarded 5-gallon paint cans. The plats were subjected to different treatments. Cost of material was $2.00 per plat. A metal Parshall flume with a 6" throat was secured at a cost of $18.00, and a Geib type divisor box of metal secured at a cost of $16.00. The arrangement of plats is shown by the accompanying illustration. Six gully-stops of old woven fencing and stump posts were installed. This work when underway and after completion is shown by the illustrations on this and the preceding page. Two dozen students took this course, which was offered on short notice as an elective.

Mr. Powers' course in soil erosion and its control is the most complete to come to the attention of this desk. Many other colleges, however, have included theoretical instruction on this subject as a part of other courses.
-- The Editor.

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One Lesson out of Thousands
— A True Story

By Harold G. Anthony

EDUCATIONAL ASSISTANT, LOUISIANA PROJECT

There was a time when Aunt Jane Austin and her family of pickaninnies lived on the fat of the land. Even after the death of her husband, Aunt Jane and her "chilluns" tilled their little forty-acre farm and came out at the end of each crop season with money in the bank.

That was a long time ago -- at least in the comparative time of a life's span. But those happy days are gone forever for Aunt Jane Austin. The big cotton crops, the bank accounts, are only memories of the past.

But I'm getting ahead of the story. Let's go back to 1900 and briefly bring the farming history of the Austins up to date.

It was in the opening year of the twentieth century that Aunt Jane's husband moved his family into a new house on a 40-acre wooded tract which he had bought in Jackson Parish, Louisiana. The forty acres sloped eastward from the top of the hill where the house was built. Aunt Jane's husband industriously set about clearing the timber from the little place. He made a clean job of the work, for when he finished there were only a few trees left on the plot and those were around the house on top of the knoll.

Aunt Jane's husband was a one-horse farmer. But he made that one horse a means of producing as high as ten bales of cotton in addition to a fine vegetable garden and corn crop which, with sugar cane in the damp spot around the spring and a 'tater patch, fed the family nicely. Little wonder there was money in the bank and the Austin brood·dressed well and paid their "burying lodge" dues promptly.

Life was good for a number of years. The cotton land produced heavily and the corn, 'tater and cane production was high.

Aunt Jane's husband never did know why the production of his forty acres gradually grew less and less with the passing years. He went to his grave figuring the land was just naturally wearing out and there was nothing he could do about it.

Aunt Jane and the "chillun" farmed the little place and year after year the crops became shorter and shorter. True enough, right after the World War there was a nice profit -- cotton prices were high and five bales of cotton kept the family in comparative comfort.

Cultivating the forty acres was not as easy a task in 1920 as it had been in 1910, however. Little gullies had started forming down the gently sloping hill. Sure enough, the farm was wearing out.

Then in 1921 came a big storm and a deluge of rain. The water rushed from the eaves of the house and formed a small channel down the hillside.

"It wa'n't no time befo' dat gully was too big to jump a mule across," Aunt Jane says, reminiscingly. "Befo' I hardly knowed whut was happenin' it just seemed dat gully was ten feet deep."

Let's jump a few years. That gully is now more than thirty feet deep. It has grown and spread to make nearly half of the original forty acres useless for farming. Other smaller gullies have ripped the hillside to shreds. On the few spots between the gullies where it is still smooth enough to run a plow, Aunt Jane and her now grown children and grandchildren are renting farming land from a neighbor.

Now is the plight of Aunt Jane Austin could be pointed out as the only horrible example of what unrestrained erosion can do to a hill farm, we would not be so concerned. But Aunt Jane's farm is simply one of thousands that have been ruined by the great enemy erosion.

Not just one person or one family has been deprived of independence, but millions of acres of formerly productive farm land have been washed into "dat big gully".

In round figures, according to a national reconnaissance survey recently completed by the Soil Erosion Service, a total of 709,000,000 acres have been found to be affected generally by gullying alone. Of this total 458,000,000 acres are moderately gullied, 247,000,000 acres are severely gullied generally, and the astounding total of 3,936,000 acres of land have been completely destroyed by gullying. Nearly one-half billion acres of land have been seriously affected by less spectacular sheet erosion. The report further shows that out of a total acreage of more than one and one-half billion acres of land survey, only a little more than 540,000,000 acres were found to show little or no erosion.

When we look at these figures, then we realize that the case of Aunt Jane Austin, along with thousands, yes, hundreds of thousands just like her, must have attention if we are to keep millions of citizens off the relief rolls of the future and preserve the welfare of our nation as a whole.

We must get busy on those farm lands which have not been entirely dissipated by uncontrolled erosion and bring those acres back to some semblance of their past productiveness.

Two hundred yards from Aunt Jane's little cabin is one of the most beautiful stands of timber in Louisiana. There's a wonderful lesson in conservation to be drawn between the several hundred acre protected forest and Aunt Jane Austin's deeply eroded hillside farm!

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Farmers of 40 Centuries Speak to the Farmers of America

By Mrs. Inez Marks Lowdermilk

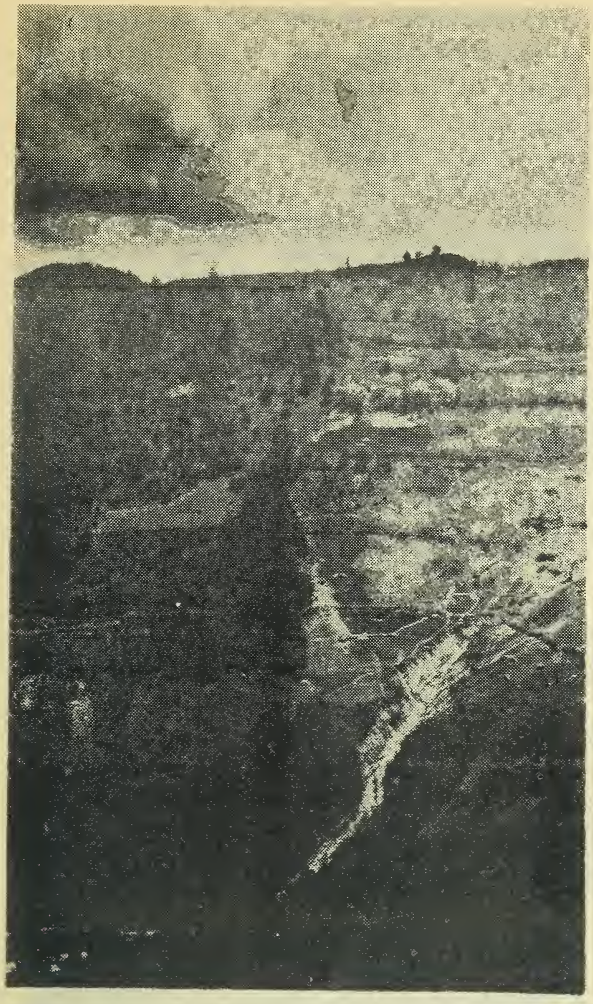
Doubtless many people think of China in terms of famines, floods and low standards of living. The 1933 Census gives China a population of 492,000,000 people -- almost a half billion, sprawled half way across Asia, where they have lived since the dawn of history. Almost 350,000,000 are rural peoples.

China's first settlers found, as did our pioneers, a land comparable in size to the United States and equally well endowed with forested mountains, rich valleys and other natural resources. China dates the periods of her "Golden Age" from 200 B.C. to 1200 A.D., when there was abundance for all and every one was honest. Then why this poverty and decline?

One evidence greets the traveler on the ocean, a hundred miles before land is sighted, in the form of a great yellow pathway coming out of the mouth of the Yangtse River as it pours forth rich silt-laden waters from the farm and mountain lands of central China. The Yellow Sea is so named because for centuries the Yellow River has dumped billions of tons of soil from the loess lands and denuded watersheds of north China, until the Sea is yellow with China's lost productivity and a portion of her population in the hinterland lives on one or two meals a day.

The appalling thought that should arouse every thinking person in the United States is that we have exploited and are destroying our natural resources at a rate never before known in the history of the world. It took China several thousand yesrs to exploit and destroy land resources that we have done in from fifty to two hundred years.

What is this destructive force which has already totally destroyed here in the United States during our few years of exploitation, over 51 million acres of our good farm lands and is in the process of destroying 200 million acres more? It is *soil erosion*, by water and wind. These appalling figures have just been compiled from field studies of the Soil Erosion Service. In China, as well as here, as long as there were new lands to exploit, the farmer moved on as old lands lost their productivity. The Chinese cut the forests in the mountainous regions, not primarily for wood, but to cultivate the rich humus soils which had been centuries in the making. Without vegetative cover, these soils, exposed to torrential rains, washed off as



A view from Shansi, northern China, where the cultivation line has been invading the forests for the last century. Note the results of erosion following cultivation of steep slopes

liquid mud in from 3 to 20 years according to the steepness of the slopes. Incalculable quantities of soil have thus been removed from hundreds of millions of acres from the watersheds of North China by this method of suicidal agriculture, leaving the slopes sterile and barren, affording a scanty living for sheep and goats. A few temple forests, still reproducing naturally, show that man's destructiveness and not climatic changes have reduced North China to her present condition.

No connection was made by the Chinese between this destruction of hill soils and the increased sudden overflowing of rivers in the lowlands and the silting up of canal irrigation systems. They ascribed their floods to the anger of the Gods. Nothing was done, except to build dykes and allow the silt to continue its destruction just as we in America have been disregarding the silting of our costly irrigation dams. Centuries ago the Chinese began dyking the Yellow River just as we have recently dyked the Mississippi. Periodically the dykes in China break with unthinkable loss of life and property, as in 1851 when the Yellow River changed its course 400 miles. Now the entire Yellow River has again silted until the stream is flowing above the level of the plain confined only by dykes. A heavy rainy season will bring another catastrophe. Why blame China for ignorance? We have spent altogether almost two billion dollars on the Mississippi, and are only now beginning to realize that there must be coordination between flood control on the lowlands and erosion control in the watershed areas.

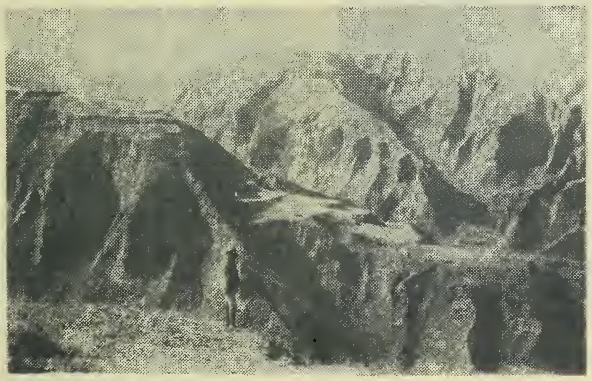
In China one can see after several centuries what it means to have irrigation systems put out of commission by silt. In the Weipei, and other places, we found poverty stricken farmers struggling to farm regions subject to droughts and severe famines. These regions had formerly been rich irrigated lands. We saw where they had removed piles of silt twenty times the amount of the original excavation of the canals, before they had given up the fight. Here in the United States we have many millions of acres of good irrigation lands equally dependent upon reservoirs that are silting up at an alarming rate. When these reservoirs are out of commission, these areas will be reduced to the hazards of dry farming, droughts and famines. Regarding floods: do you realize that probably the greatest tragedy of human history happened in 1931 in China? Colonel and Anne Lindbergh told us of the flood, but we were too absorbed with our own depression at that time to understand. Silt and heavy rains were the cause of this flood. Dykes broke in the fertile lowlands where 1164 people lived to the square mile. 25,'200,000 farm people, about the equivalent of the entire farming population of the United States, were driven from their homes, their farms buried under an average depth of nine feet of water. The damage was placed at two billion and the drowned at from half a million to two million, besides the vast number who died of starvation and disease which always stalk in the wake of such tragedies. Farmers will be interested to know that some of our surplus wheat was sold to China. Besides feeding millions of women and children in refugee camps, it was paid out as wages to two million men who built 3,000 miles of new dykes and by primitive methods moved a quantity of earth into these dykes equivalent to a mound of earth six feet square around the equator.

View of the landscape in Anwhei, central China, showing cultivation of steep slopes up to the very tops of the mountains.

North China has long been known for her fearful dust storms. The Chinese removed nature's vegetative cover from the fine-textured soils and they began to blow. No one who has ever experienced the horrors of these storms can forget them. Last year, the same forces which wrought havoc in China initiated us to dust storms here in America. We are having a repetition now. That soil wastage by wind erosion can largely be controlled by intelligent treatment has been proved on demonstration areas of the Soil Erosion Service on the Texas panhandle. If immediate and thorough steps are not taken to check this monster of wind erosion in our own plains, its raids will continue with increasing frequency and severity, and the desert will encroach upon grazing and farm lands of the west.

May the spectacles of China arouse us as a nation to give our lands a new deal before it is too late! We have ruthlessly cut our forests with no thought of sustained productivity. We have overgrazed our hill lands until areas, formerly a grazing paradize, are now unable to feed one head per square mile. Deprived of their vegetative cover, these lands as well as millions of acres of our sloping farm lands, are in the grip of sheet and gully erosion. Erosion is like a giant octopus, reaching out its tentacles over our lands, sucking away the moisture and fertility and leaving a wasted heritage for future generations.

Our golden age of exploitation is passing. There are no new lands to exploit. Either we must save the productivity of our lands from wastage by soil erosion, or, by neglect or lack of understanding, like the Chinese, condemn posterity to poverty and low standards of living.



Gully erosion on a gigantic scale in the province of Shansi. Abandoned terraces on the ridges between the gullies show that this area was once intensively cultivated. The gully here is about 600 feet deep.

BY WAY *of* BIOGRAPHY

R. H. Davis

Regional Director LaCrosse Project

looks like a flippant lad just out of college, but don't let that fool you...has had lots of experience in studying and controlling soil and water runoff in his 29 years...born in Jasper County, Missouri, June 1, 1906...the first sixteen years were spent on farms in southwestern Missouri, western North Dakota, and northeastern Kansas...graduated from Kansas State College in 1927...since then, all of his work has in the field of agriculture, with specific attention paid to soils and erosion studies...was assistant in soil survey and instructor in soils at K.S.A.C....Became superintendent of the Soil Erosion Experiment Station at Hays, Kansas in 1929...while there, developed a hole-digging cultivator ...named superintendent of a similar experimental post at LaCrosse Wisconsin in 1931, remaining there until called to the Soil Erosion Service in 1933 to head Project No. 1, on the Coon Creek watershed...since then, two subprojects have been placed under his wing...knows erosion conditions of the Upper Mississippi Valley region intimately...has keen insight into his problems and knows how to face them...short...possesses boundless energy...likeable...

Mapping the Cohocton Valley Watershed Soils

By Henry R. Adams

SOIL EXPERT NEW YORK PROJECT

One of the youngest projects of the Soil Erosion Service is now getting well underway in the upper Cohocton watershed in Steuben County, New York.

Located in the Northern Appalachian plateau and Plateau Border region, its surface configuration is characterized by deep, rather steep-walled valleys separated by broad, flat-topped ridges. The valleys range up to two miles in width and the larger ones have a floor of glacial outwash material. The ridges are one or more miles in width.

Soils of the region are formed by the weathering of deep glacial material, but are so immature that they have little profile development. Frequently, there is an inch or more of podzol layer in virgin areas, but tillage has destroyed all trace of this layer in the cultivated fields. Because of this fact, the recognition and classification of sheet erosion is much more difficult than in some other sections of the country where A and B horizons are readily identified by color, texture, or other properties.

Although potatoes are practically the only cash crop in the region, our surveys indicate that about two-thirds of the total area is used each year for the production of small grains, hay and pasture. This varied use, together with the protection afforded by four months of frozen ground and snow cover, has partially controlled erosion, and has made it possible to farm slopes up to 25% or more without inducing destructive erosion.

With two-thirds of the land planted to close-growing crops, erosion might appear to be a problem of little moment in this region. On most farms, however, the fields are improperly arranged and the close-growing crops are distributed over the slopes in a manner which fails to provide adequate protection for the soil. Also the farmers have not been content to use land which could safely be plowed, but slopes exceeding 50% have often been used for the production of field crops.

Under these conditions, the proposed remedies for sheet erosion are the removal of the steeper land from cultivation, and the practice of strip-cropping, contour farming and cover cropping on the gentler slopes. It is probable that little use can be made of terracing in this area.

On these deep glacial till soils our slope classes have been arranged as follows:

A.	0-5%	Little or no control measures necessary.
B.	5-15%	Recommend for cultivation if strip-cropping and contour farming are practiced.
BB.	15-25%	Recommended primarily for close-growing crops, either annual or otherwise. It may be used for intertilled crops if the farm has too little A and B land, but in such cases the strips must be narrow, and cover only a small percent of the total slope.
C.	25-35%	Not recommended for tillage but may be used for permanent meadow or pasture.
D.	35%	Too steep to effectively control erosion unless forested.

In mapping slopes, we are using a combined symbol, with numbers dividing the slope into 5% increments, and letters indicating proper land use programs. Thus we may classify a slope as 5B if the slope is between 5% and 10%, as 30C if the slope is between 30% and 35%, etc. This classification has had considerable value in correlating erosion with slope to establish the slope use classes, and will also aid in drawing up cooperative agreements.

In other sections of the watershed, there are large areas of glacial till underlain at a depth of a few inches by a hard, impervious clay. Our studies on such soils indicate that cultivation should be limited entirely to slopes of less than 15%, but as yet no slope classes have been definitely worked out.

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College trainee group receiving instruction in gully control.

Terracing Alone Insufficient for Erosion Control

By Ernest Carnes

CHIEF EROSION SPECIALIST, SPARTANBURG PROJECT

The casual observer traveling the highways of certain parts of the Piedmont section will be impressed with the large amount of farm terracing which has been done in the past, yet soil erosion is advancing at a terrific rate. It is estimated in the section around Spartanburg and Greenville, South Carolina, that ninety percent of all the land has been terraced, yet gullied hillsides can be seen on every hand. Streams are running red with the blood of the soil and it is estimated that approximately twenty-five percent of the land in the Piedmont has been ruined by erosion.

A local business man recently stated that the first terracing done in Spartanburg County was in 1884. While farm terracing has been practiced for more than fifty years in this region, erosion has continued at an accelerated rate. Abandoned hillsides, now covered with trees, still show the marks of the old terrace ridges.

There are several reasons why farm terracing has not been more effective in the past:

(1). Most of the terraces have had too much grade or fall, which caused the terrace channels to scour, especially at or near the outlets, and practically all of the topsoil has been lost. Fields are usually redder near the terrace outlets. Farmers have done very little to control the water at the terrace outlet. The increased volume and velocity of water at this critical point has resulted in severe gullying in many instances.

(2). Terracing is a form of hillside drainage. The small terrace embankments used in the past have been inadequate in most instances to properly dispose of the runoff. These smaller ridges should have been spaced closer for maximum efficiency. The majority of terraces have been too small, especially during periods of high rainfall intensity. Farmers generally have underestimated the hydraulic effects of water passing down the slopes of cultivated fields.

(3). Lack of equipment to build a sufficient terrace embankment is another important cause of failure of the old terracing system.

(4). Very often lands were not terraced until practically all of the topsoil was lost. The runoff from such areas is much greater than from those having the original profile, thereby making it difficult to build terraces that would hold. Farm machinery on the average farm is inadequate to build a sufficient ridge under these conditions.

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Vol. 2, No. 4, Apr.
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A. Sitz
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Hurlen
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Dooley
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Lorenz 8/12/3
Marse 8/14
Douglas
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Schneiderman
9/7/35
Hansen
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A. J. Johnson
9/1/36

I ________________ a farm ________________
(own - operate)   (inside - outside)

the project area.

(5). Many of the slopes that were terraced in this section of the Piedmont were entirely too steep for mechanical structures. Such lands should never have been cleared and put into cultivation.

(6). Farmers generally have not used the proper system of terrace maintenance. Improper plowing of terraces has greatly lowered their efficiency. Very few farmers in this section have maintained a definite water channel above the terrace ridge, which is so essential to the proper functioning of the terracing system.

(7). Probably one of the greatest causes for the failure of many of our terraces in the Piedmont has been the lack of proper vegetative control of hillside lands. Many of our farmers have continued to grow cotton on steep slopes. This practice cannot be continued under average conditions if we are to save our soils.

Farmers must visualize the necessity of proper land use and be guided by these principles in the future, if the remainder of the good soils of the Piedmont is to be saved for future generations. Definite rotations, which would have greatly aided in keeping terraces from breaking, have not been followed as a rule. In a great majority of cases the greatest benefits which have been derived from the present terracing system has been the resultant contour cultivation which goes hand in hand with a proper terracing program.

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MUDDY RAIN FALLS NEAR PULLMAN

Not to be outdone by the choking dust storms of the Central States and the floods of the South, the Pacific Northwest came across with a combination of silt and rain Sunday night, March 24, centering in the vicinity of Pullman, Washington.

Dust, blown from the wind-swept regions of central Oregon and Washington into the precipitation belt in the Palouse area, converted the rain into muddy water. The silt burden was so heavy that windshield wipers left the glass murky.

The muddy rain emphasized to the people in the Pullman district the necessity of wind erosion control in the Northwest as well as in the Great Plains, Regional Director W. A. Rockie reports.

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